CLAIMS

1. An apparatus for performing speech coding in a CELP system, said apparatus comprising:

an adaptive codebook in which previously synthesized excitation signals are stored;

a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook having a first subcodebook in which excitation vectors composed of a small number of pulses are stored and a second subcodebook in which excitation vectors composed of a large number of pulses are stored;

means for obtaining a synthesized speech using excitation information acquired from said adaptive codebook and said stochastic codebook, using LPC obtained by performing LPC analysis on an input speech signal;

means for obtaining gain information for said synthesized speech using a relation of said synthesized speech and said input speech signal; and

means for transmitting said LPC, said excitation information and said gain information.

2. The apparatus according to claim 1, wherein said stochastic codebook further has control means for controlling a gain for respective excitation vectors in said first subcodebook and said second subcodebook corresponding to a distance between pulses of the excitation vectors in said first subcodebook, and computation means for obtaining the excitation information using the gain controlled excitation

vectors.

3. The apparatus according to claim 1, wherein said control means makes the gain for the excitation vectors in said second subcodebook relatively small in a case where the distance between pulses of excitation vectors in said first subcodebook is short, while makes the gain for the excitation vectors in said second subcodebook relatively large in another case where the distance between pulses of excitation vectors in said first subcodebook is long.

4. The apparatus according to claim 3, wherein said control means calculates the gain according to a following equation 1,

$$g = |P1 - P2| / L \quad \text{...equation (1)}$$

wherein g is the gain, P1 and P2 are respectively excitation vector positions in first subcodebook, and L is a vector length.

5. The apparatus according to claim 1, said stochastic codebook further has instruction means for instructing an excitation vector to be acquired from said first subcodebook and said second subcodebook corresponding to a distance between excitation vectors in said first subcodebook, and switching means for switching between outputs of the excitation vectors in said first subcodebook and said second subcodebook according to the instruction by said instruction means.

6. An apparatus for performing speech coding in a CELP system, said apparatus comprising:

an adaptive codebook in which previously synthesized

excitation signals are stored;

a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook having a first subcodebook in which excitation vectors composed of a small number of pulses are stored and a second subcodebook in which excitation vectors composed of a large number of pulses are stored;

means for obtaining a synthesized speech using excitation information acquired from said adaptive codebook and said stochastic codebook, using LPC obtained by performing LPC analysis on an input speech signal;

means for executing a voiced/unvoiced judgment on said input speech signal using said LPC;

means for obtaining gain information for said synthesized speech using a relation of said synthesized speech and said input speech signal; and

means for transmitting said LPC, said excitation information and said gain information.

7. The apparatus according to claim 6, wherein said stochastic codebook further has control means for controlling a gain for respective excitation vectors in said first subcodebook and said second subcodebook corresponding to a distance between pulses of the excitation vector in said first subcodebook, and computation means for obtaining the excitation information using the gain controlled excitation vectors.

~~8. The apparatus according to claim 6, wherein said~~

control means makes the gain for the excitation vector in said second subcodebook relatively small in a case where the distance between pulses of excitation vectors in said first subcodebook is short, while makes the gain for the excitation vector in said second subcodebook relatively large in another case where the distance between pulses of excitation vectors in said first subcodebook is long.

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9. The apparatus according to claim 7, wherein said control means calculates the gain according to a following equation 2,

$$g = |P1 - P2| / R \quad \text{...equation (2)}$$

wherein g is the gain, P1 and P2 are respectively excitation vector positions in said first subcodebook, and R represents a weighting coefficient and is a vector length L in a case where a result of the voiced/unvoiced judgment indicates a voiced speech, and $L \times 0.5$ in another case where the result of the voiced/unvoiced judgment indicates an unvoiced speech.

10. The apparatus according to claim 6, said stochastic codebook further has instruction means for instructing an excitation vector to be acquired from said first subcodebook and said second subcodebook corresponding to a distance between excitation vectors of said first subcodebook, and switching means for switching between outputs of the excitation vectors in said first subcodebook and said second subcodebook according to the instruction by said instruction means.

11. An apparatus for performing speech decoding in a

CSLP system, said apparatus comprising:

an adaptive codebook in which previously synthesized excitation signals are stored;

a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook having a first subcodebook in which excitation vectors composed of a small number of pulses are stored and a second subcodebook in which excitation vectors composed of a large number of pulses are stored;

means for receiving LPC, excitation information and gain information transmitted from a coding side; and

means for decoding a speech using said excitation information multiplied by said gain information, and said LPC .

12. The apparatus according to claim 11, wherein said apparatus further comprises means for providing said LPC to said stochastic codebook .

~~13.~~ A method for performing speech coding in a CELP system, said method comprising the steps of:

controlling a gain for respective excitation vectors in a first subcodebook and a second subcodebook corresponding to a distant between pulses of excitation vectors in said first subcodebook of a stochastic codebook having said first subcodebook in which excitation vectors composed of a small number of pulses are stored and said second subcodebook in which excitation vectors composed of a large number of pulses are stored;

obtaining excitation information using gain controlled

excitation vectors;

obtaining a synthesized speech using excitation information acquired from an adaptive codebook and said stochastic codebook, using LPC obtained by performing LPC analysis on an input speech signal; and

obtaining gain information for said synthesized speech using a relation of said synthesized speech and said input speech signal.

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14. The method according to claim 13, wherein said method further comprises the step of performing a voiced/unvoiced judgment on said input speech signal using said LPC.

15. A method for performing speech coding in a CELP system, said method comprising the steps of:

selecting an excitation vector in either of a first subcodebook or a second subcodebook corresponding to a distant between pulses of excitation vectors in said first subcodebook of a stochastic codebook having said first subcodebook in which excitation vectors composed of a small number of pulses are stored and said second subcodebook in which excitation vectors composed of a large number of pulses are stored;

obtaining excitation information using the selected excitation vector;

obtaining a synthesized speech using excitation formation acquired from an adaptive codebook and said stochastic codebook, using LPC obtained by performing LPC analysis on an input speech signal; and

obtaining gain information for said synthesized speech using a relation of said synthesized speech and said input speech signal.

16. The method according to claim 15, wherein said method further comprises the step of performing a voiced/unvoiced judgment on said input speech signal using said LPC.

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17. A recording medium readable by a computer, said medium storing a speech coding program , an adaptive codebook in which previously synthesized excitation signals are stored, and a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook having a first subcodebook in which excitation vectors composed of a small number of pulses are stored and a second subcodebook in which excitation vectors composed of a large number of pulses are stored, said program including the procedures of:

controlling a gain for respective excitation vectors in said first subcodebook and said second subcodebook corresponding to a distant between pulses of excitation vectors in said first subcodebook of said stochastic codebook;

obtaining excitation information using gain controlled excitation vectors;

obtaining a synthesized speech using excitation information acquired from said adaptive codebook and said stochastic codebook, using LPC obtained by performing LPC analysis on an input speech signal; and

obtaining gain information for said synthesized speech

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using a relation of said synthesized speech and said input speech signal.

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